CLAIMS:

1. A bistable liquid crystal display device comprising:

two cell walls enclosing a layer of a composition comprising nematic liquid crystal material and finely divided solid particles dispersed therein, at least one of said cell walls being translucent;

at least one electrode on each of said cell walls for applying an electric field across at least some of said liquid crystal material;

a first surface alignment on an inner surface of one of said cell walls for inducing adjacent molecules of said liquid crystal material to adopt a first orientation, and a second surface alignment on an inner surface of the other of said cell walls for inducing adjacent molecules of said liquid crystal material to adopt a second orientation which is different from said first orientation;

whereby said nematic liquid crystal material will adopt a first stable molecular configuration in response to a pulse of a unidirectional electric field of suitable magnitude and duration via said electrodes and will adopt a second stable molecular configuration in response to a similar pulse of opposite polarity, said second configuration being different from said first configuration.

2. A device as claimed in claim 1, wherein said particles are capable of triboelectric charging.

3. A device as claimed in claim 1, wherein said particles are capable of acquiring charge in suspension in a liquid crystal material.

4. A device as claimed in claim 1, further including drive electronics for applying unidirectional electric field pulses to the electrodes.

5. A device as claimed in claim 1, wherein said particles have a size in the range 1 to 1000 nm.

6. A device as claimed in claim 1, wherein said particles have a size in the range 5 to 50 nm.

7. A device as claimed in claim 1, wherein said first surface alignment induces planar alignment and said second surface alignment induces homeotropic alignment.

8. A device as claimed in claim 1, wherein said surface alignments induce planar alignment at substantially 90° to each other.

9. A device as claimed in claim 1, wherein said particles comprise at least one material selected from the group comprising silica, alumina, clay, and titanium dioxide.

10. A device as claimed in claim 1, wherein said particles are silica particles.

11. A device as claimed in claim 1, wherein said particles are present in a concentration of from 0.1% to 25% by weight of said composition.

12. A device as claimed in claim 11, wherein said particles are present in a concentration of from 1 to 15% by weight of said composition.

13. A device as claimed in claim 11, wherein said particles are present in a concentration of from 1 to 5% by weight of said composition.

14. A device as claimed in claim 1, further comprising at least one polarizer for distinguishing between different optical states of said liquid crystal material.

15. A device as claimed in claim 1, wherein said liquid crystal has a pleochroic dye dissolved therein.

16. A bistable liquid crystal display device comprising:

two cell walls enclosing a layer of nematic liquid crystal material, at least one of said cell walls being translucent;

said liquid crystal material having finely divided solid particles dispersed therein, said particles having sizes in the range 1 to 500 nm;

at least one electrode on each cell wall for applying an electric field across at least some of said liquid crystal material;

a first surface alignment on an inner surface of one cell wall for inducing adjacent molecules of said liquid crystal material to adopt a first orientation;

a second surface alignment on an inner surface of the other cell wall for inducing adjacent molecules of said liquid crystal material to adopt a second orientation;

a structure for distinguishing between different optical states of said liquid crystal material; and

drive electronics connected to said electrodes, for applying pulses of DC electric fields of desired magnitude, polarity and durations to said liquid crystal material, whereby said liquid crystal material will adopt one of two different stable optical states in response to an electric field of suitable magnitude, polarity and duration being applied and said liquid crystal material will adopt the other of said optical states in response to an electric field of suitable magnitude and duration and opposite polarity being applied.

17. An electrophoretically-controlled bistable liquid crystal display device comprising:

a first cell wall and a second cell wall enclosing a layer of a composition comprising a nematic liquid crystal material having finely divided charged particles dispersed therein, at least one of said cell walls being translucent;

at least one electrode on each cell wall for applying an electric field across at least some of said liquid crystal material; and

a first surface alignment on an inner surface of said first cell wall for inducing adjacent molecules of said liquid crystal material to adopt a first orientation, and a second surface alignment on an inner surface of said second cell wall for inducing adjacent molecules of said

liquid crystal material to adopt a second orientation which is different from said first orientation;

whereby said liquid crystal material can be switched to a first stable molecular configuration by the application of a DC electric field pulse of suitable field strength and duration to cause movement of charged particles to said first cell wall so as substantially to prevent said first surface alignment from influencing alignment of molecules of liquid crystal material in said layer; and

said liquid crystal material can be switched from said first configuration to a second stable molecular configuration by the application of a DC electric field pulse of suitable field strength and duration and opposite polarity so as to cause movement of sufficient charged particles away from said first cell wall to permit said first surface alignment to influence alignment of molecules of liquid crystal material in said layer.

18. A device as claimed in claim 17, wherein said particles have a size in the range 1 to 1000 nm.

19. A device as claimed in claim 17, wherein said particles have a size in the range 5 to 50 nm.

20. A device as claimed in claim 17, wherein said first surface alignment is arranged for inducing planar alignment and said second surface alignment is arranged for inducing homeotropic alignment.

21. A device as claimed in claim 17, wherein said surface alignments are arranged for inducing planar alignment at substantially 90° to each other.

22. A device as claimed in claim 17, wherein said particles comprise at least one material selected from the group comprising silica, alumina, clay, and titanium dioxide.

23. A device as claimed in claim 17, wherein said particles are silica particles.

24. A device as claimed in claim 17, wherein said particles are present in a concentration of from 0.1% to 25% by weight of said composition.

25. A device as claimed in claim 17, wherein said liquid crystal has a pleochroic dye dissolved therein.

26. An electrophoretically-controlled bistable liquid crystal display device comprising:

a first cell wall and a second cell wall enclosing a layer of nematic liquid crystal material, at least one of said cell walls being translucent;

said liquid crystal material having finely divided charged particles dispersed therein;

at least one electrode on each cell wall for applying an electric field across at least some of said liquid crystal material;

a first surface alignment on an inner surface of said first cell wall for inducing adjacent molecules of said liquid crystal material to adopt a first orientation, and

a second surface alignment on an inner surface of said second cell wall for inducing adjacent molecules of said liquid crystal material to adopt a second orientation which has different optical properties from said first orientation; and

a structure for distinguishing between two different optical states;

wherein said liquid crystal material can be induced to adopt said first orientation by application of a DC pulse for causing at least some of said particles to migrate to said second surface alignment; and

wherein said liquid crystal material can be induced to adopt said second orientation by application of a DC pulse for causing at least some of said particles to migrate to said first surface alignment.

27. An electrophoretically-controlled bistable liquid crystal display device comprising:

a first cell wall and a second cell wall enclosing a layer of nematic liquid crystal material, at least one of said cell walls being translucent;

said liquid crystal material having finely divided charged particles dispersed therein;

at least one electrode on each cell wall for applying an electric field across at least some of said liquid crystal material; and

a first surface alignment on an inner surface of said first cell wall for inducing adjacent molecules of said liquid crystal material to adopt a planar alignment, and a second surface alignment on an inner surface of said second cell wall for inducing adjacent molecules of said liquid crystal material to adopt a homeotropic alignment;

whereby said liquid crystal material can be switched to a stable homeotropic alignment by the application of a DC electric field pulse of suitable field strength and duration to cause movement of charged particles to said first cell wall so as substantially to prevent said first surface alignment from influencing alignment of molecules of liquid crystal material in said layer; and

said liquid crystal material can be switched from said stable homeotropic alignment to a stable planar alignment by the application of a DC electric field pulse of suitable field strength and duration and opposite polarity so as to cause movement of sufficient charged particles away from said first cell wall to permit said first surface alignment to influence alignment of molecules of liquid crystal material in said layer.